Figure 1
(prior art)

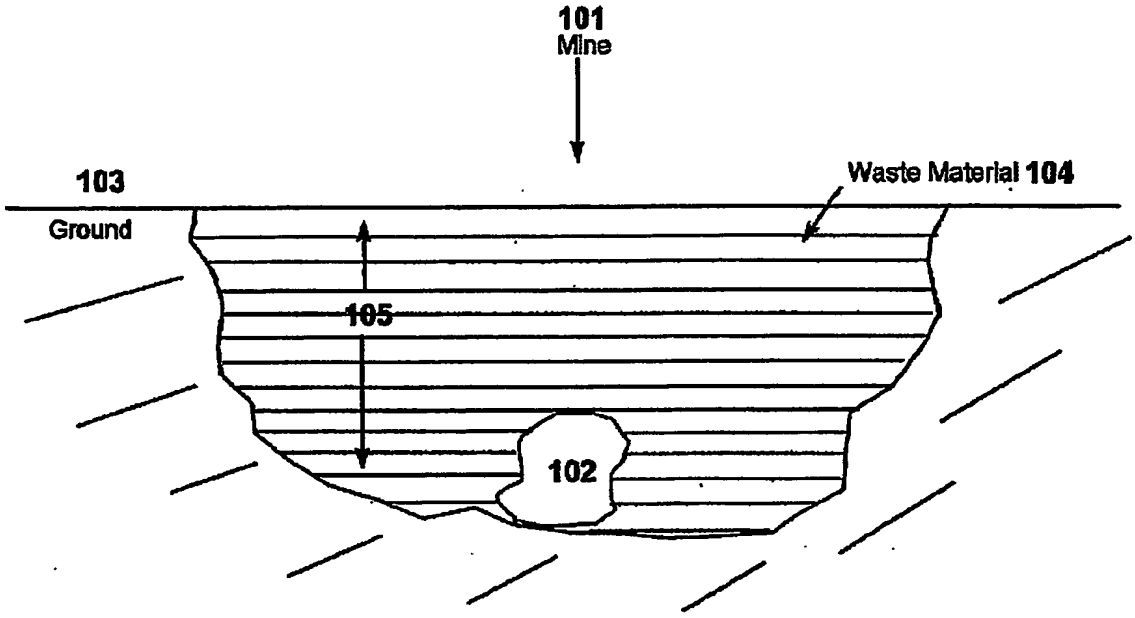


Figure 2
prior art

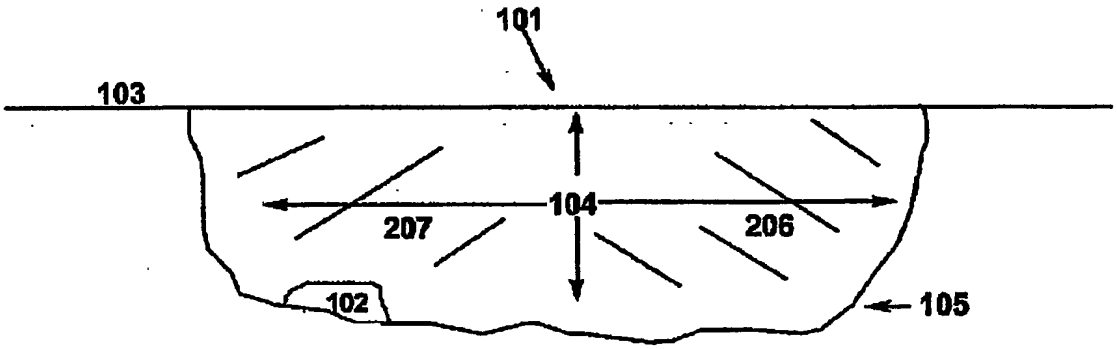
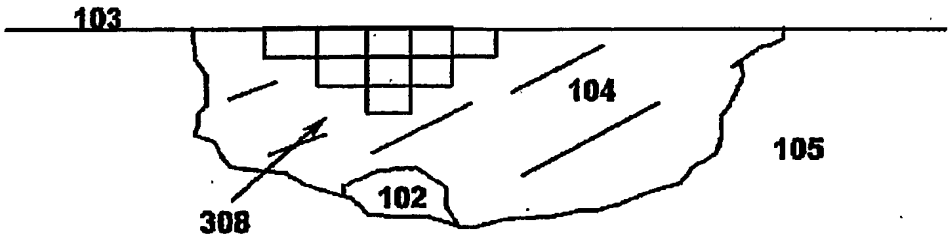


Figure 3
prior art



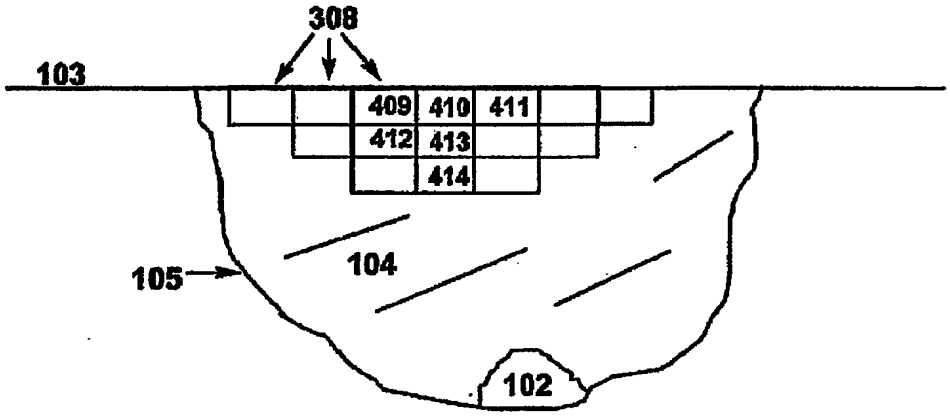


Figure 4
prior art

Figure 5
prior art

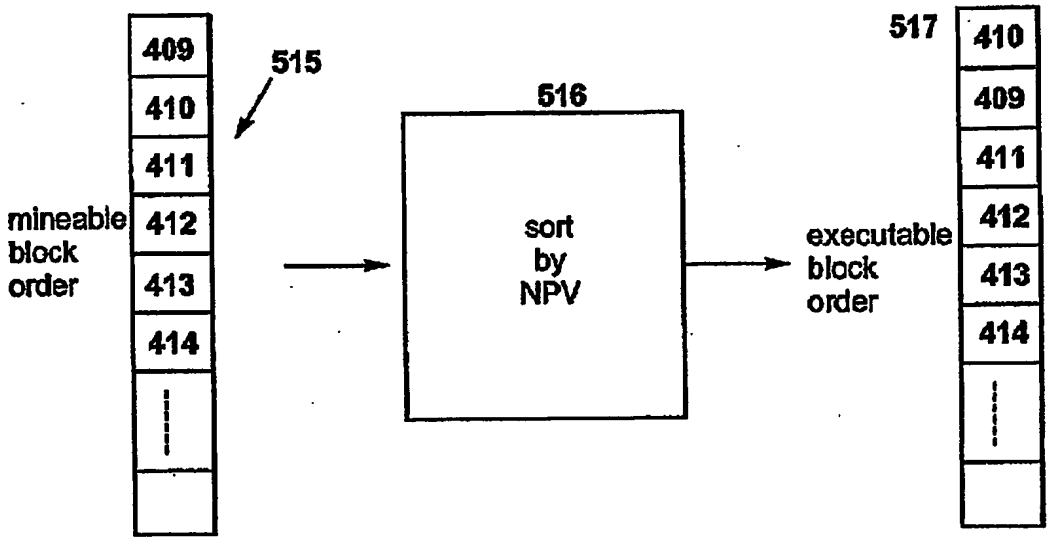
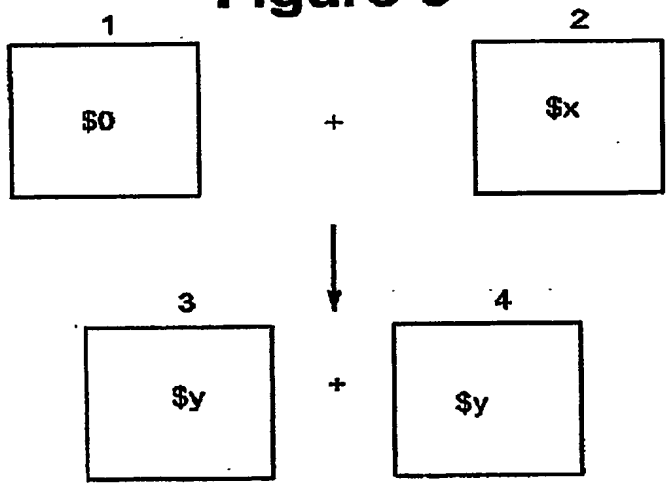


Figure 6



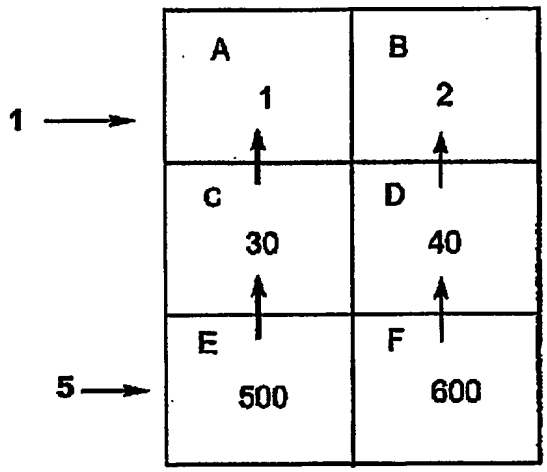


Figure 7

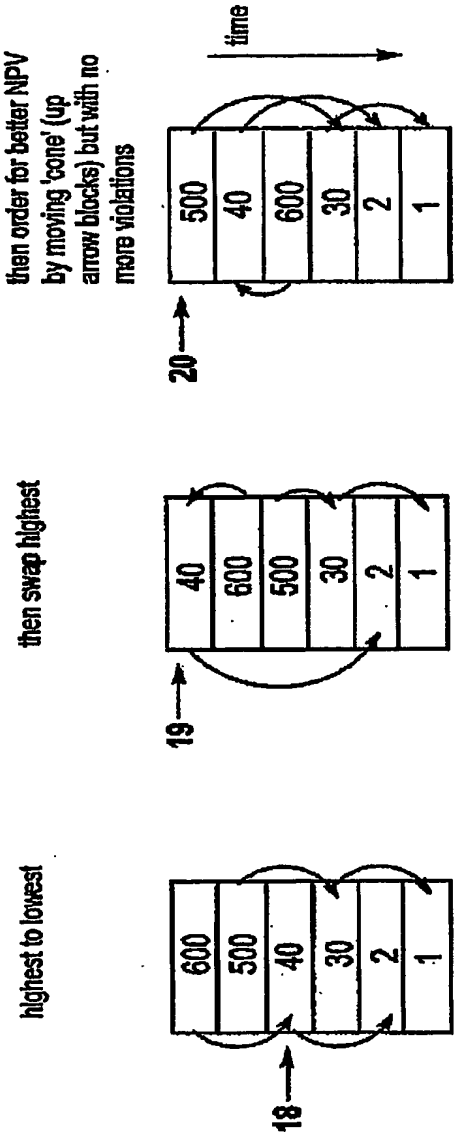


Figure 8

Figure 9

Figure 10

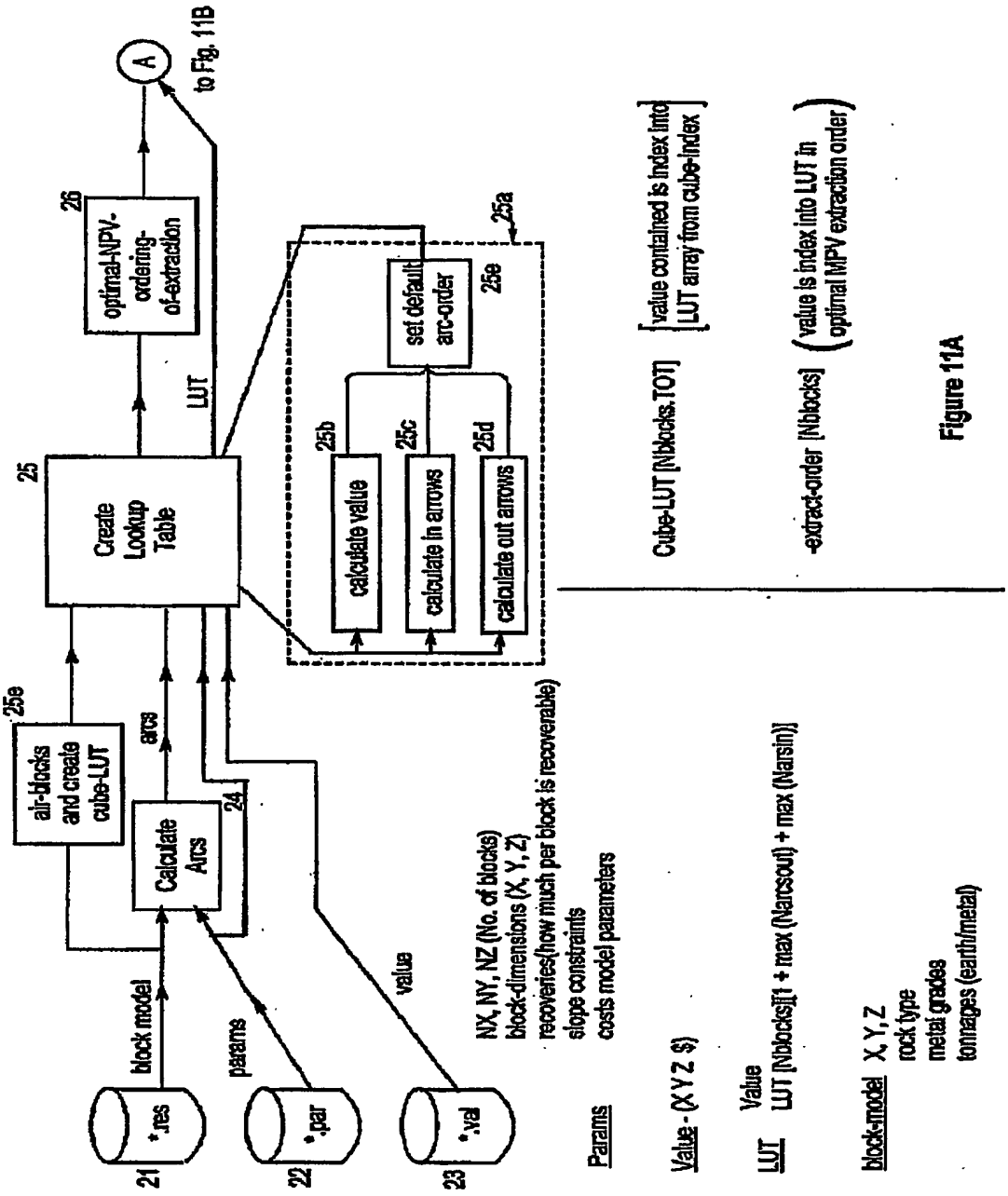

to Fig. 11B
A
26
optimal-NPV-ordering-of-extraction
LUT
25
Create Lookup Table
25a
25b
calculate value
25c
calculate in arrows
25d
calculate out arrows
25e
set default arc-order
25e
all-blocks and create cube-LUT
arcs
Calculate Arcs
24
block model
params
value
21
*.res
22
*.par
23
*.val
NX, NY, NZ (No. of blocks)
block-dimensions (X, Y, Z)
recoveries(how much per block is recoverable)
slope constraints
Params
costs model parameters
Value - (X Y Z $)
Value
LUT
LUT [Nblocks][1 + max (Narcsout) + max (Narsin)]
block-model
X, Y, Z
rock type
metal grades
tonnages (earth/metal)
Cube-LUT [Nblocks.TOT]
[value contained is index into LUT array from cube-index]
-extract-order [Nblocks]
(value is index into LUT in optimal MPV extraction order)

Figure 11A

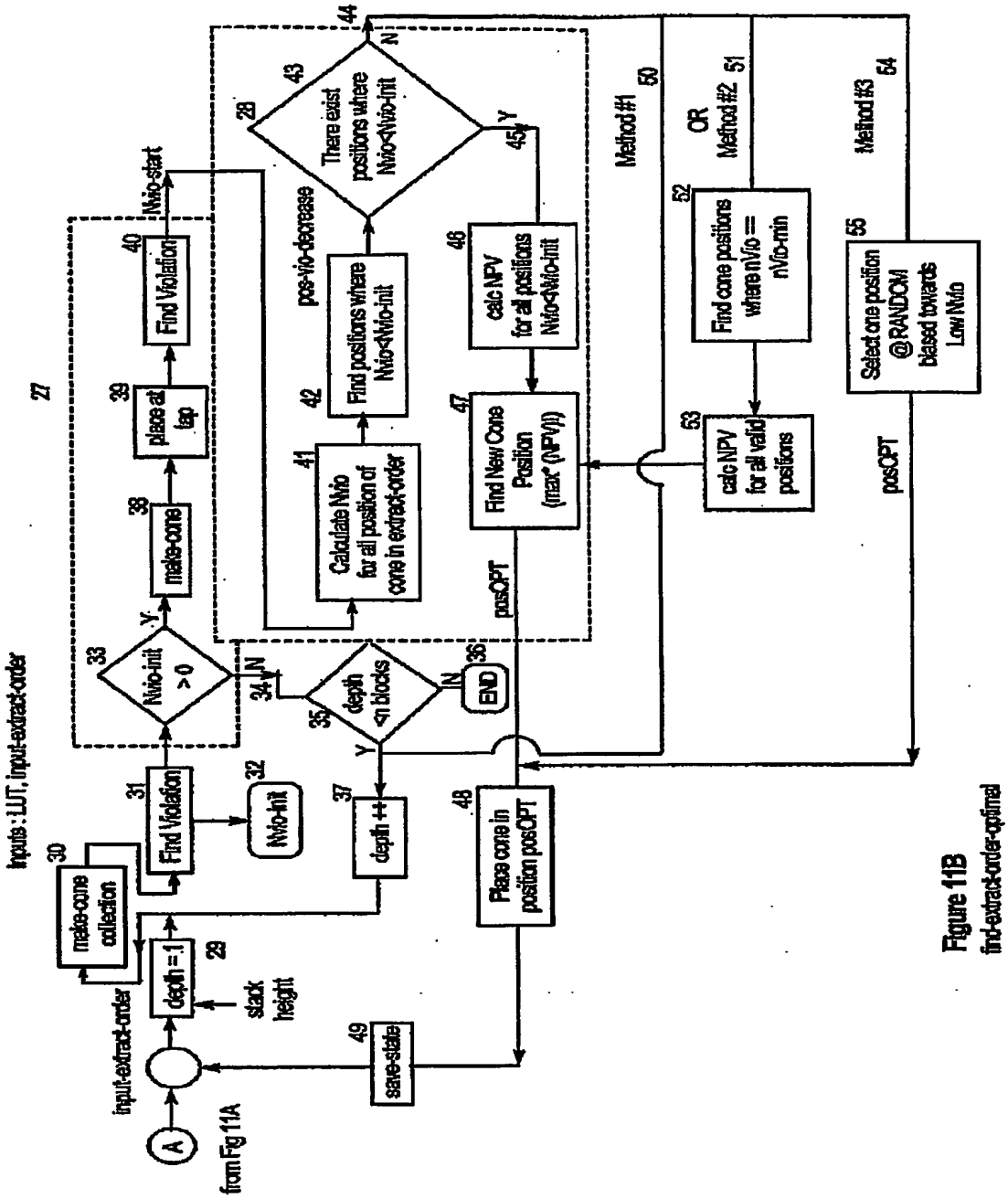
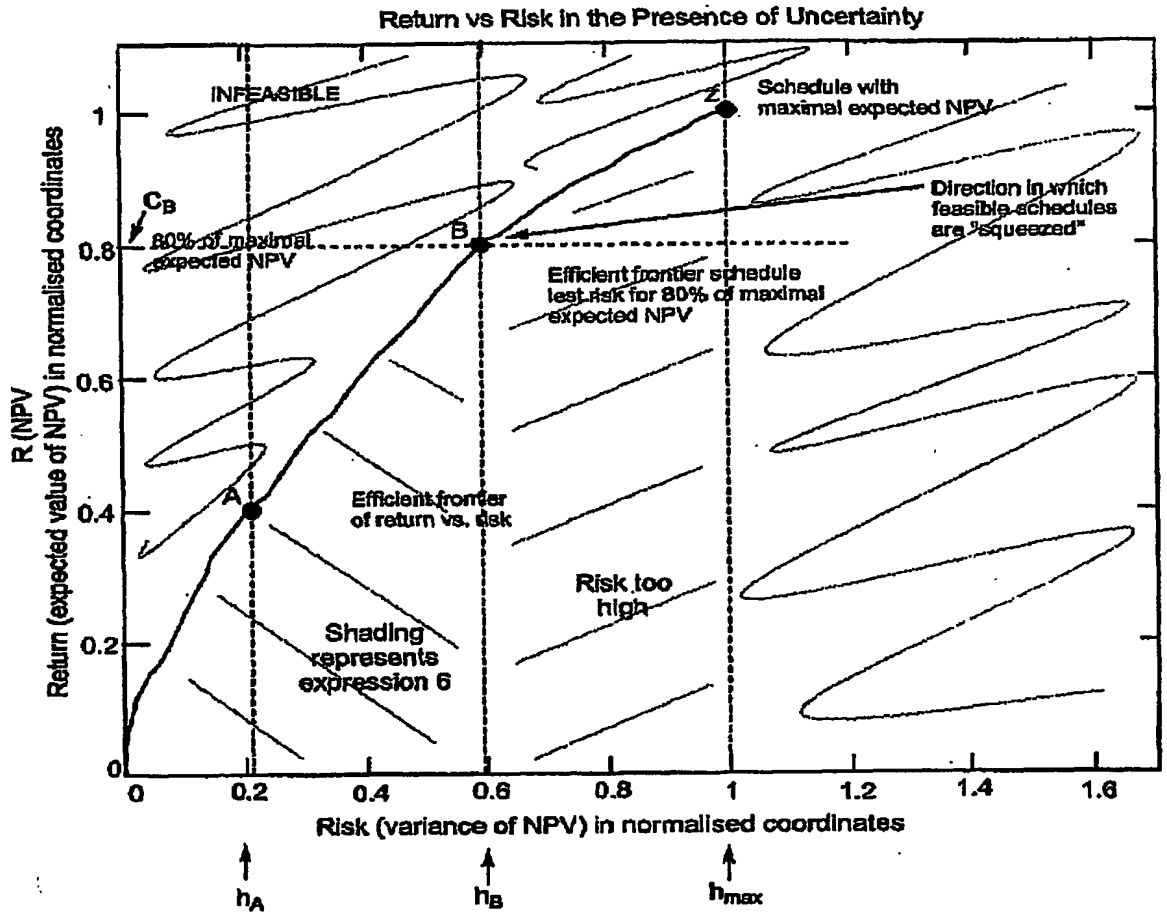


Figure 11B
find-extract-order-optimal

Figure 12


Return vs Risk in the Presence of Uncertainty
INFEASIBLE
Schedule with maximal expected NPV
Z
C_B
80% of maximal expected NPV
B
Direction in which feasible schedules are "squeezed"
Efficient frontier schedule least risk for 80% of maximal expected NPV
A
Efficient frontier of return vs. risk
Risk too high
Shading represents expression 6
R (NPV
Return (expected value of NPV) in normalised coordinates
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Risk (variance of NPV) in normalised coordinates
h_A
h_B
h_{max}

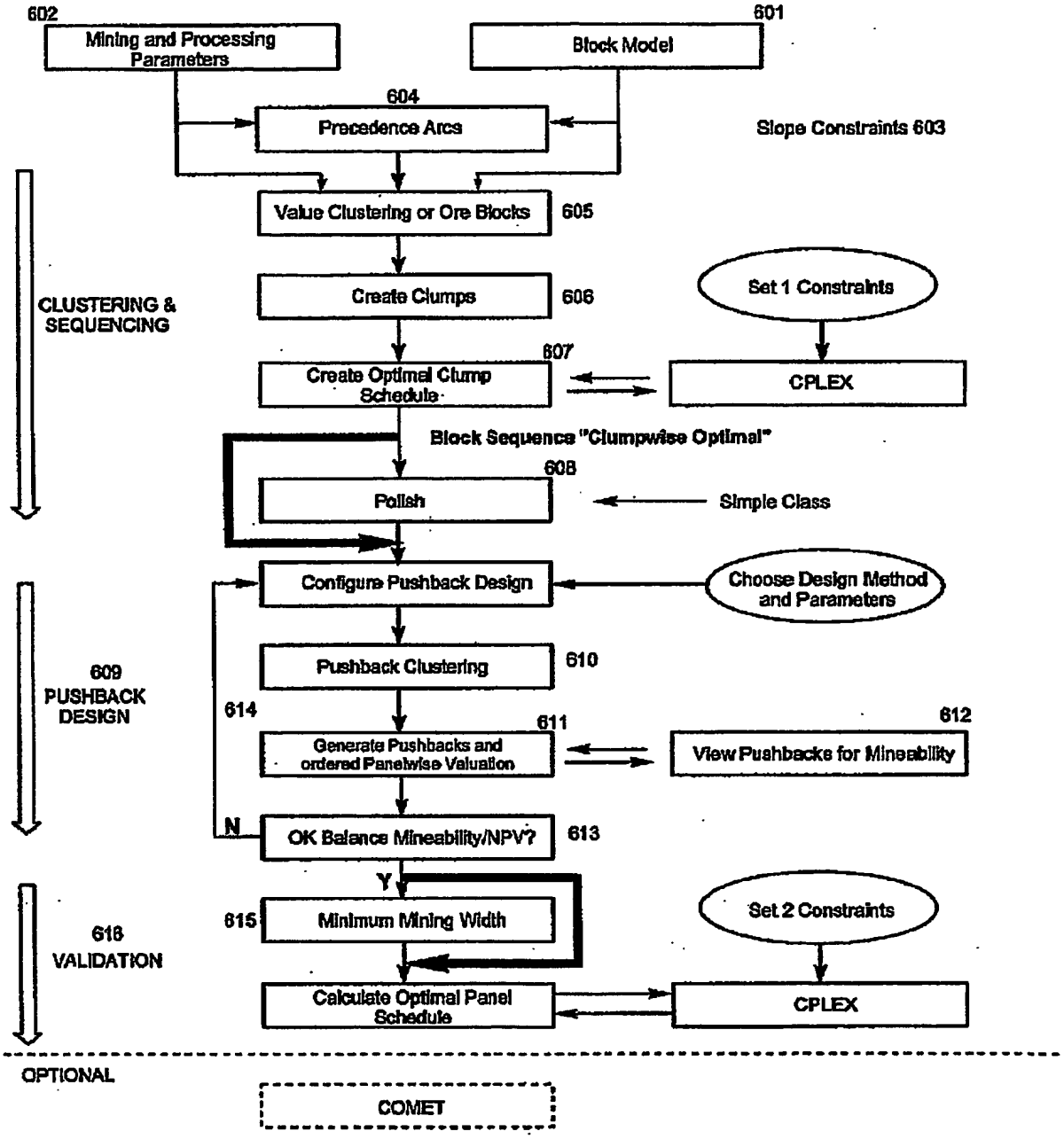


Figure 13 KlumpKing Top-Level Flow Chart

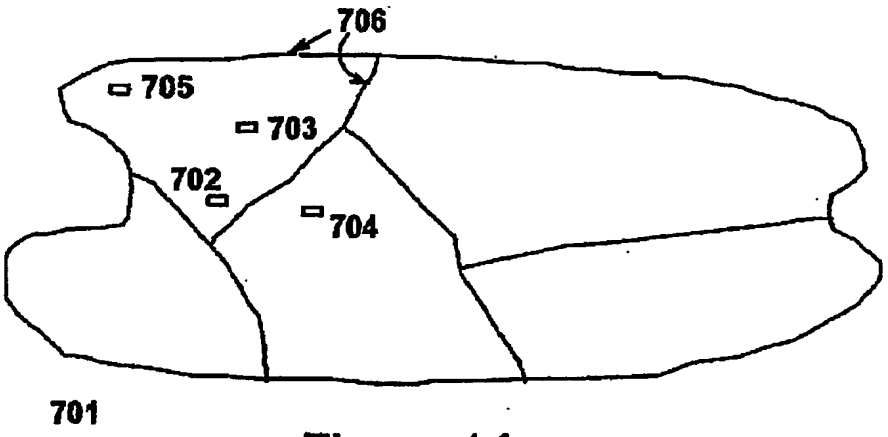


Figure 14

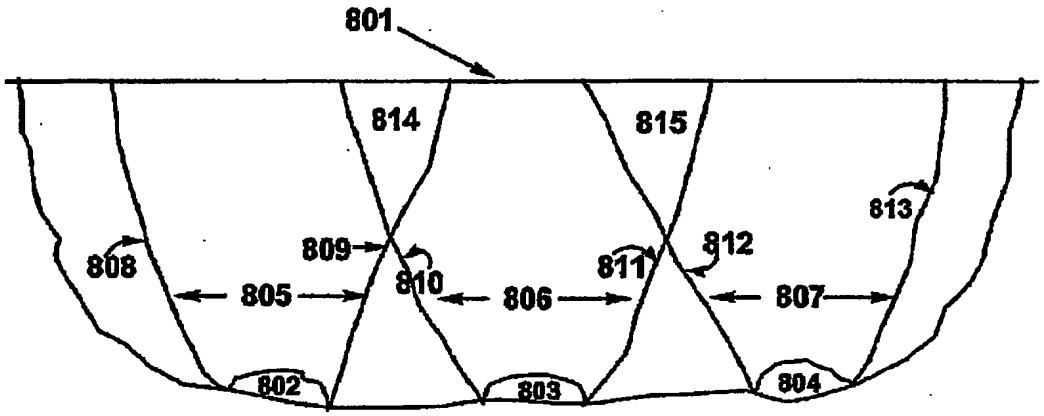


Figure 15

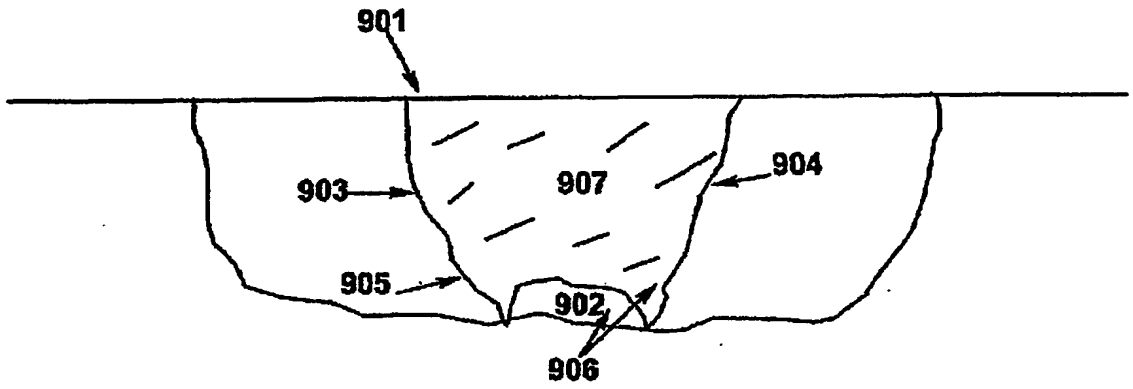


Figure 16

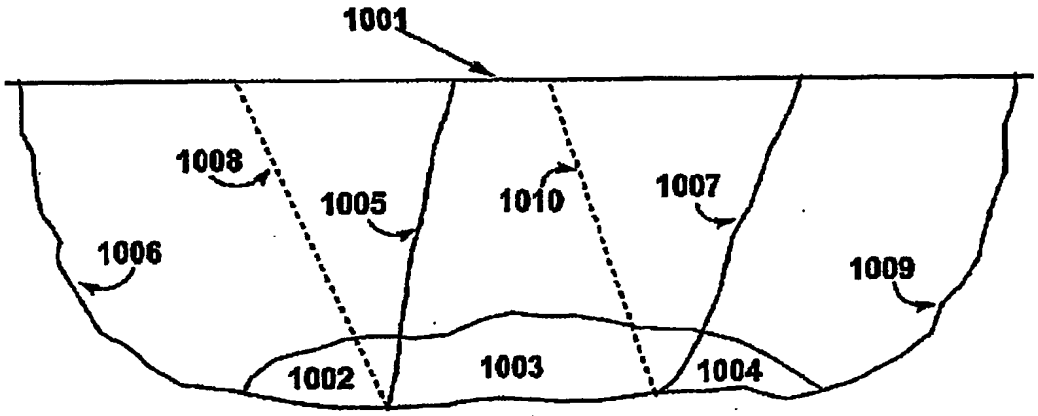


Figure 17

Plan view : 2D block slice

1	8	13	2	3
11	9	14	4	6
10	12	15	7	5

Figure 18a

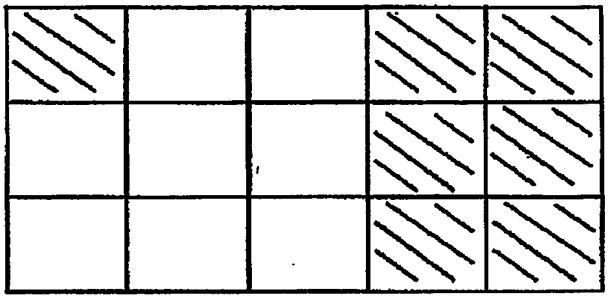


Figure 18b

= cluster #1

= cluster #2

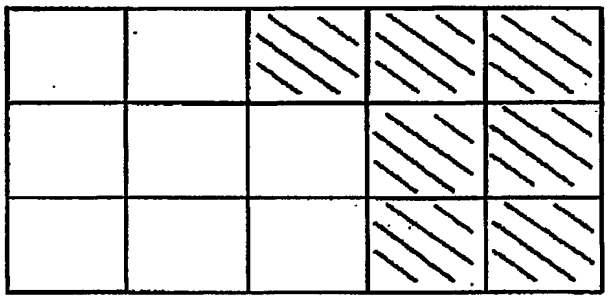


Figure 18c

= cluster #1

= cluster #2